Draft Work Plan

Site Characterization Study
North Boeing Field Fire Training Center
King County Airport
Seattle, Washington

March 29, 1992

Prepared for

Boeing Environmental Affairs
Seattle, WA

Prepared by

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Exhibit B

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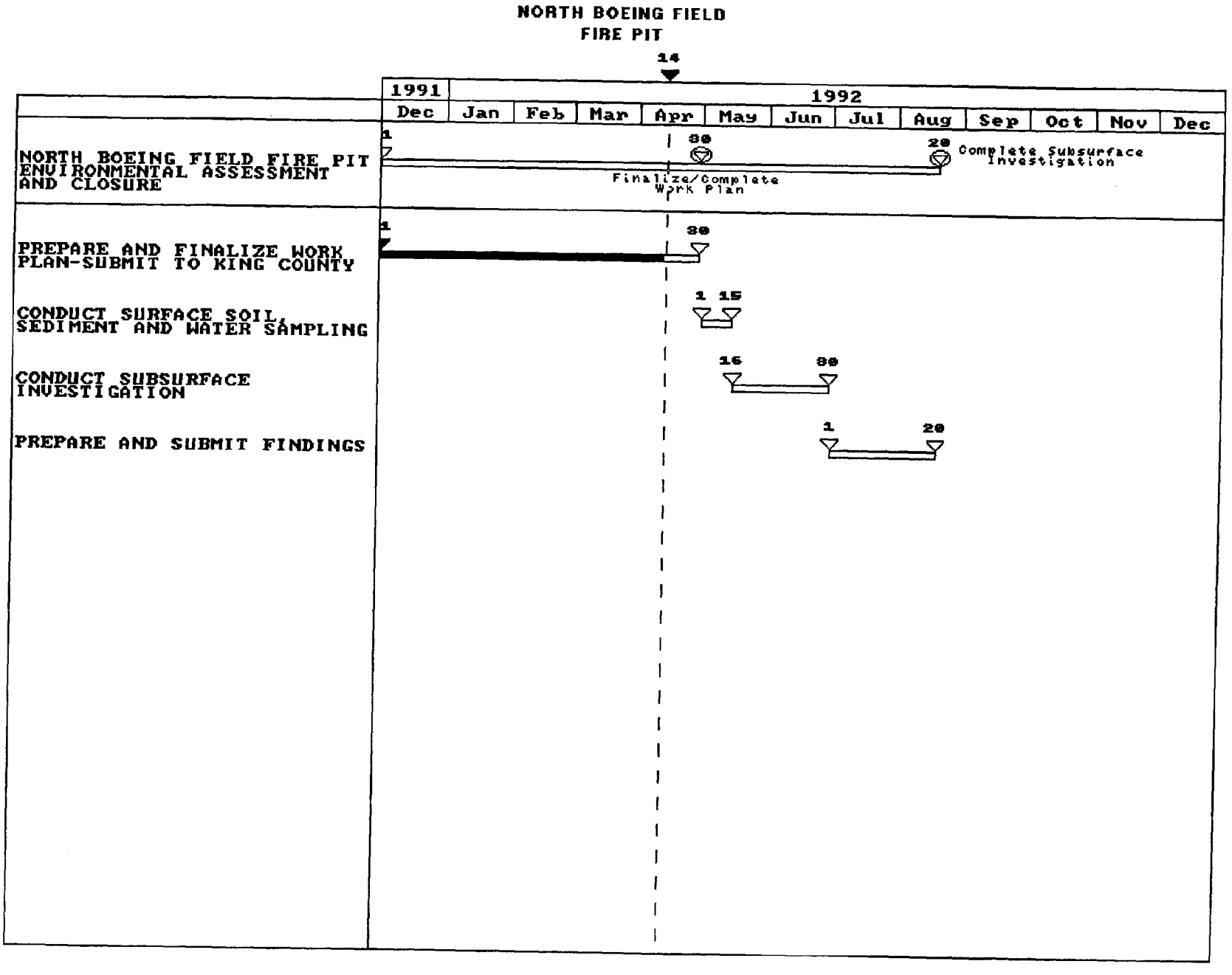

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1.0 INTRODUCTION

This work plan summarizes background information and describes an exploratory program to further characterize soil and groundwater conditions at the site of a fire training center located near the north end of the King County Airport, in Seattle, Washington. For the purposes of this work plan, and in keeping with accepted terminology, the project location will be referred to as the North Boeing Field Fire Training Center (NBFFTC).

Previous investigations at the NBFFTC include: 1) a July 1983 study by Shannon & Wilson, Inc.; 2) sediment sampling and testing by Laucks Testing Laboratories, Inc., May 1984; and 3) a study by CH_2M Hill Northwest, dated December 1987. These investigations are discussed in more detail below.

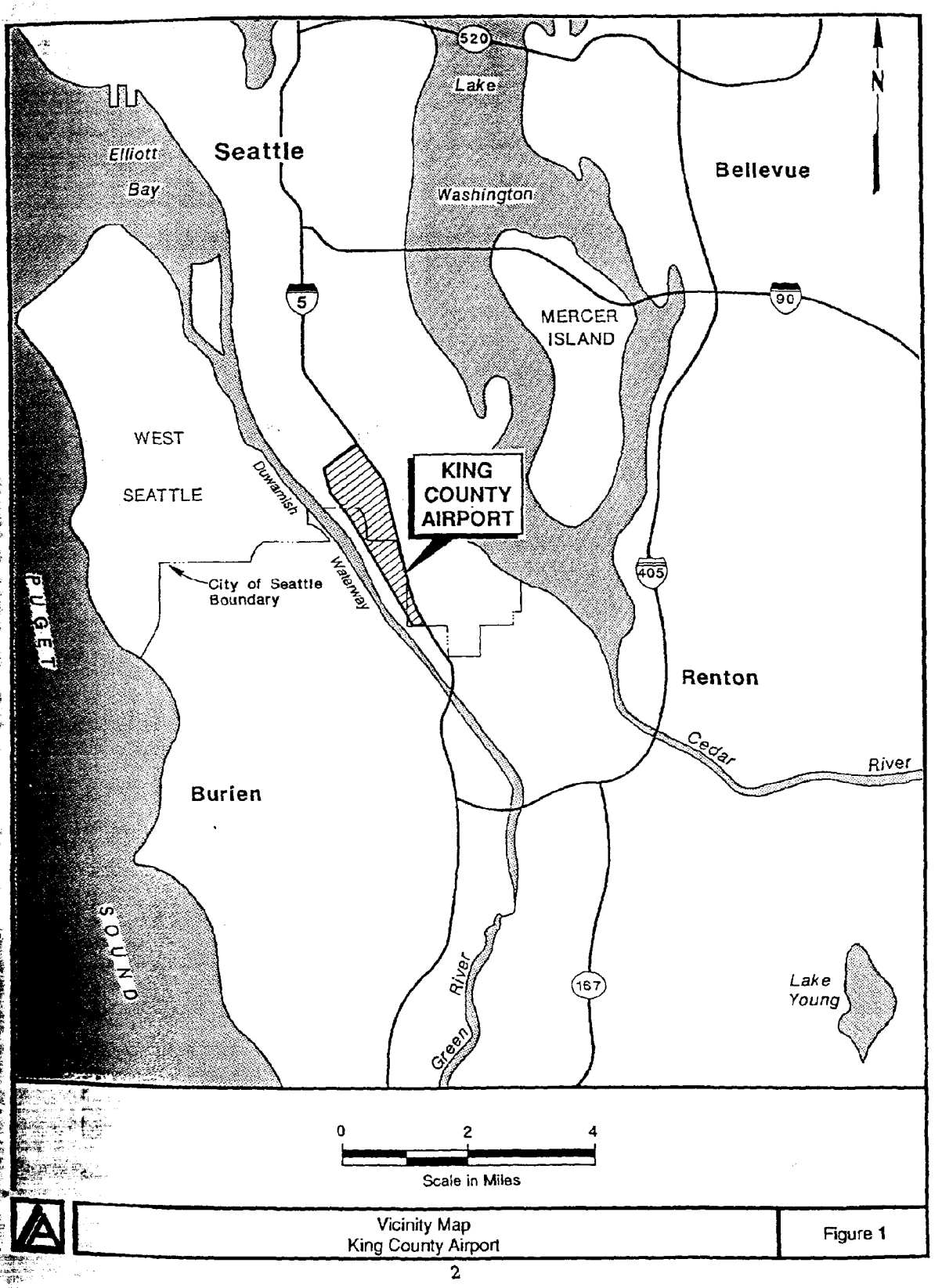
This work plan is structured to accommodate a phased investigative approach. The first phase will include resampling groundwater in four existing monitoring wells, collecting several surficial soil samples, drilling a series of shallow borings for collecting near-surface soil samples, and regrading/hydroseeding the surface. Future phases of work may include additional surface soil sampling, drilling soil borings and/or monitoring wells, and possibly other tasks.

2.0 BACKGROUND INFORMATION AND SITE DESCRIPTION

The NBFFTC is located approximately 200 ft southeast of a non-operating Seattle City Light power station, and 1,000 ft north-northwest of the north end of the King County Airport main Runway. A vicinity map showing the location of the King County Airport is presented on Figure 1, the site location relative to the North Boeing Field facility is shown on Figure 2.

The training center consists of an earthen impoundment about 150 ft in length and 100 ft in width (Figure 3). The impoundment is divided into two cells by an earthen dike. The southern cell is approximately 110 ft in length and the northern cell is approximately 40 ft in length. The bottoms of both cells are at the approximate elevation of the surrounding ground surface. The containment berms surrounding the impoundment and the dividing dike are approximately 2-3 ft high. Both cells are currently unpaved and uncovered.

A preliminary review of aerial photographs indicates that: 1) the NBFFTC did not exist at its current location prior to 1960, and 2) the limits of the facility's containment berms may



Vicinity Map
King County Airport

Figure 1

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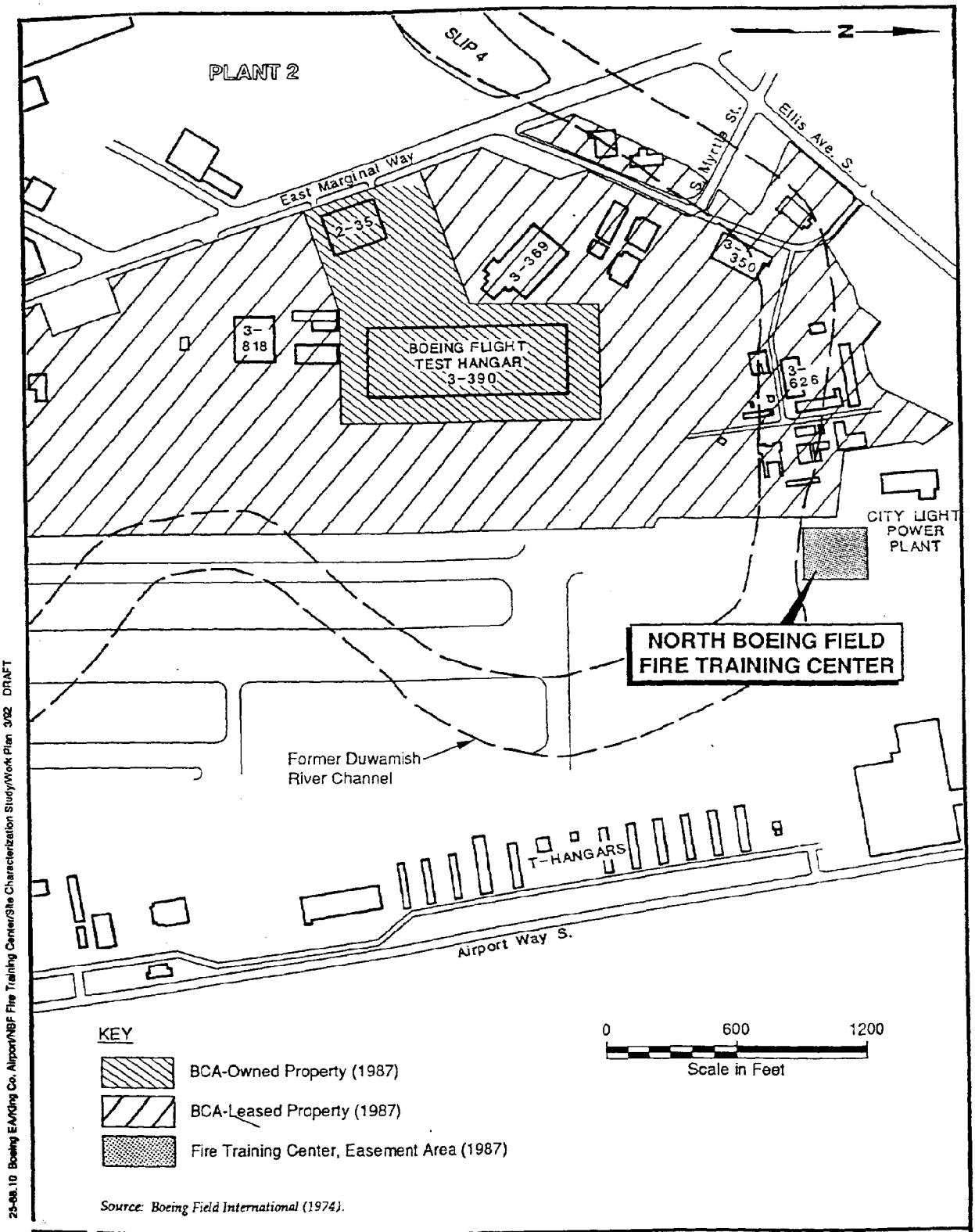

Source: Boeing Field International (1974).

25-08.10 Boeing EA/King Co. Airport/NBF Fire Training Center/Site Characterization Study/Work Plan 3/92 DRAFT

Location Map
North Boeing Field Fire Training Center

Figure 2

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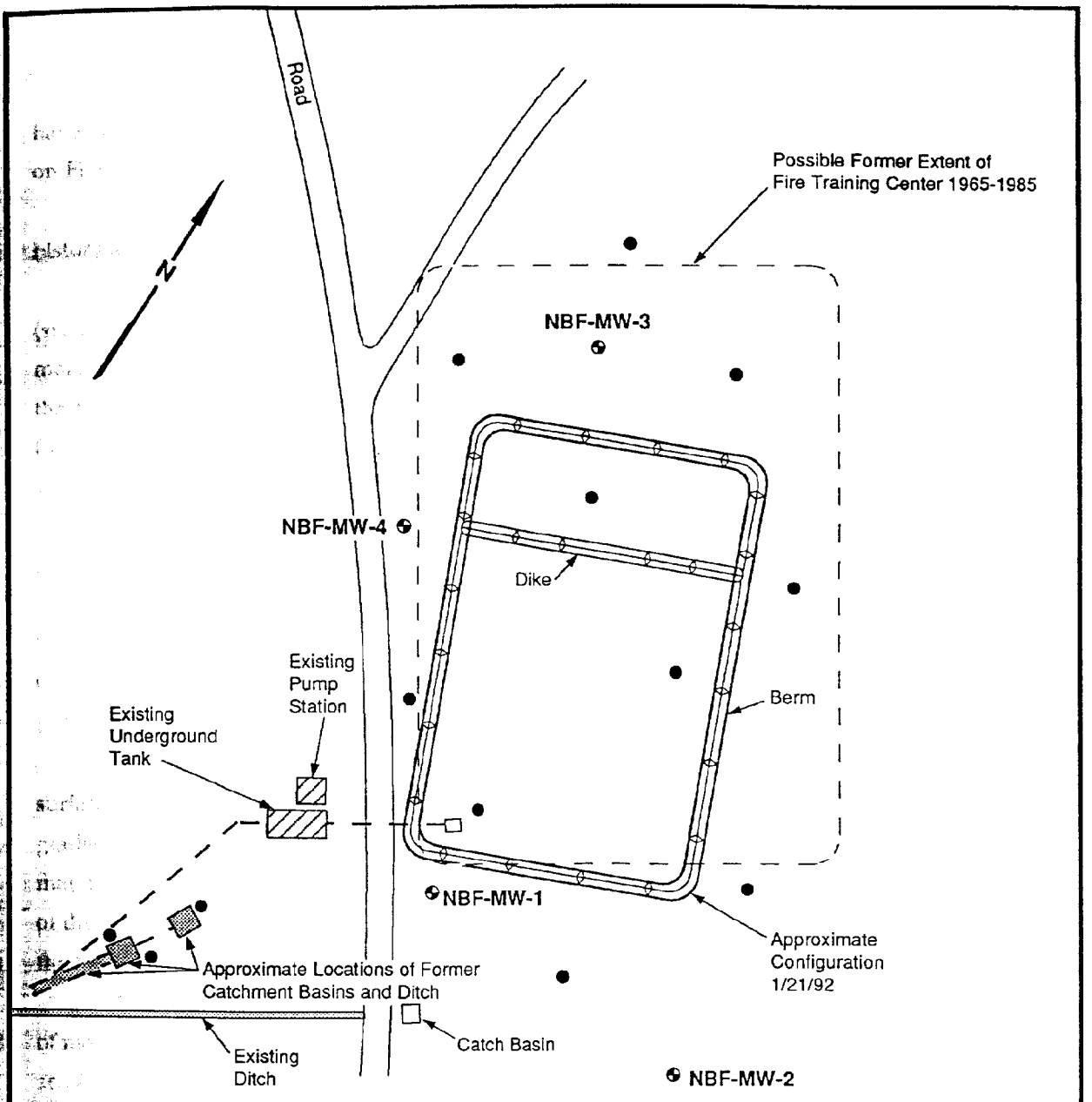

KEY

- Approximate Location of Existing Monitoring Well (1987). (No Surface Expression of NBF-MW-3 Visible on 1/21/92.)
- Approximate Location of Proposed Soil Boring

0 50 100

Approximate Scale in Feet

Note: This figure for general use only. Do not use for for detailed engineering or construction.

Source: CH2M Hill (1987); Shannon & Wilson, Inc. (1983)

Site Map Showing Proposed Soil Boring Locations | Figure 3

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have been larger in the past. Present reported features, and possible past features, are shown on Figure 3.

The NBFFTC was used as a practice area for flammable liquids training. The operational history and types of flammables used are not well documented.

The soil and groundwater surveys previously conducted at the site by Shannon & Wilson (six soil borings in 1983), Laucks Testing (sediment testing in 1984) and CH_2M Hill (4 monitoring wells in 1987) indicates that, in general, native soil and groundwater conditions at the NBFFTC are similar to those found throughout the North Boeing Field area. However, the fill at the site, which comprises the upper 6-10 ft of soil, consists of a mixture of soil, cinders, and brick (Shannon & Wilson 1983). Naturally deposited soil consists of gray silt and silty fine sand with interbedded wood fragments (Shannon & Wilson 1983). Shallow groundwater consists of an unconfined aquifer (CH_2M Hill 1987).

The six borings drilled by Shannon & Wilson (1983) were 7.5-8 ft in depth. Petroleum hydrocarbon odors were detected in three of the six borings. A tarry substance and possible burnt petroleum was described during installation of three of the four CH_2M Hill monitoring wells.

Groundwater is generally encountered at a depth of 6.5-10 ft below the present ground surface, and flow is to the south (CH_2M Hill 1987). This reported groundwater flow is cross gradient to the westerly flow generally typical of the North Boeing Field area. This anomaly may be due to the influence of the former Duwamish River channel, which existed in the area of the NBFFTC (see Figure 2). Groundwater conditions may also be slightly influenced by tidal fluctuations in the Duwamish Waterway.

Analyses of groundwater samples from the four CH_2M Hill wells indicated the presence of methylene chloride and acetone at low concentrations (possible laboratory contaminants). No semivolatile compounds or PCBs were detected by CH_2M Hill.

3.0 WORK PLAN ELEMENTS

As noted previously, this work plan is directed toward a phased investigative approach, with the initial focus on resampling existing wells and obtaining shallow soil samples. These activities are described in detail below; future tasks, such as the installation of additional monitoring wells, deeper soil sampling, etc. are discussed in a general sense only. If such future activities are necessary, supplemental additions to this work plan may be required.

3.1 HISTORICAL INVESTIGATION

A brief historical investigation of the NBFFTC will be performed. Information gathered will be used in better defining prior configurations of the site through time, as well as identifying historical activities or structures which may have influenced soil or groundwater quality at the site.

The historical investigation will involve obtaining more complete aerial photographic coverage of the site, researching documents and maps of the area (such as Sanborn Fire Maps) which may contain relevant information, and a review of available engineering drawings for the facility.

3.2 GROUNDWATER QUALITY

Groundwater conditions will be initially evaluated by measuring water levels and analyzing samples collected from the four existing CH_2M Hill monitoring wells. The samples will be analyzed according to the schedule in Table 1. Analytical procedures are listed in Table 2.

Prior to purging, the wells will be examined for floating petroleum product with a clear acrylic bailer. The bailer will be lowered to just below the water surface and then retracted and examined for free-phase petroleum products. If free product is present, the well will not be sampled for groundwater quality; however, a sample of the product will be obtained for characterization purposes.

Following this, the wells will be purged using a centrifugal pump and dedicated $\frac{5}{8}$-inch polyethylene tubing. After a minimum of three well volumes have been purged, the wells will be sampled with a peristaltic pump using disposable polyethylene tubing. Samples for metals will be field filtered and preserved. The physical field parameters of pH, conductivity, and

TABLE 1

WATER SAMPLING/TESTING PROGRAM

Sampled Media	Total Petroleum Hydrocarbons	Volatile Organics	Semivolatile Organics	Metals[a]	PCBs
Groundwater					
CH_2M Hill Wells(4)	X	X	X	X	X
Surface Water					
Rain Water in Pits	X	X	X	X[b]	X

(a) Samples to be field filtered and preserved.

(b) Surface water samples will not be filtered.

TABLE 2

ANALYTICAL PROCEDURES

Analyte	Analytical Procedure[a]	Sample Matrix
Volatile Organics	SW 624/8240[b]	Water and soil/sediment
Semivolatile Organics	SW 625/8270	Water and soil/sediment
PCBs	SW 608/8080	Water and soil/sediment
Metals[c]	SW 6010/7000 series	Water and soil/sediment[d]
Total Petroleum Hydrocarbons (TPH)[e]	WTPH-HCID WTPH-G WTPH-D WTPH-418.1 modified	Water and soil/sediment

(a) From *Test Methods for Evaluating Solid Waste* (SW-846), EPA September 1987, and *Guidance for Remediation of Releases from Underground Storage Tanks*, Washington State Department of Ecology, July 1991 [including Appendix L for soil (October 1991)].

(b) With xylenes added.

(c) Metals = Arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

(d) Surface water unfiltered; groundwater filtered; total metals in soil/sediment.

(e) More than one TPH analytical procedure may be required to properly characterize each water or soil/sediment sample.

temperature will be measured when the samples are collected. Groundwater samples will be stored at approximately 4°C until delivered to the laboratory.

3.3 SOIL QUALITY INVESTIGATION

The principal purposes of additional soil sampling at the NBFFTC are to: 1) obtain more complete soil chemistry information, and 2) try to determine the lateral and vertical limits of the area(s) which may have been impacted by past use of the facility. Specific steps to meet these goals are discussed below.

3.3.1 Site Preparation

Any rainwater contained inside the existing containment cells will be analyzed and drained prior to commencing field work. If no visible sheen is noted on the water surface, and water quality following analysis is good (see Table 1 for testing parameters), the water will be pumped onto the grass surface near the facility. If a sheen or other indications of poor quality are noted (i.e., high laboratory values), a vacuum truck will be contracted to pump and haul the accumulated water. Any water hauled offsite will be tested and either disposed of or treated according to appropriate regulations.

If soft subgrade conditions exist within or around the two cells, either following removal of ponded rainwater or because of other conditions, it may be necessary to improve subgrade conditions prior to the investigation. This could be accomplished by one or a combination of the following: hand removal of soft soil, scraping with a dozer or backhoe, or placement of clean imported fill.

3.3.2 Sampling Berm and Cell Bottoms

Following removal of any accumulated rainwater, the containment berms and cell bottoms will be sampled. Samples will be collected within the upper 1 ft of soil using properly decontaminated hand tools. Sampling locations will be identified in the field and will be selected to obtain representative discrete samples. Table 3 summarizes the anticipated surficial soil sampling/testing program. All surface soil samples will be stored at approximately 4°C until delivered to the laboratory.

TABLE 3

SURFACE SOIL SAMPLING/TESTING PROGRAM

Location	Approximate Number of Soil/Sediment Samples	Approximate Number of Samples to Be Collected and Analyzed				
		Total Petroleum Hydrocarbons	Volatile Organics	Semi-Volatile Organics	Metals	PCBs
Dike/Berm[a]	4	4	4	1	1	4
Impoundment Bottoms[a]	3	3	3	1	1	3
Quality Assurance[b]		1	1			1
Totals	7	8	8	2	2	8

(a) Samples to be collected from upper 1.0 ft.

(b) QA sample = equipment blank.

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3.3.3 Soil Borings

A total of 13 soil borings are currently planned in the configuration shown on Figure 3. Table 4 summarizes the number of borings within each subarea, and lists the anticipated number of samples to be analyzed. The locations were selected based on obtaining adequate coverage of the current and probable former impoundment perimeters. Locations were also selected in areas where prior investigations have noted potential for hydrocarbons in soil. The locations shown on Figure 4 are estimated locations only; they may be adjusted based on field conditions and on information obtained from the historical investigation.

The soil borings will be drilled using either a truck-mounted, trailer-mounted, or hand-portable hollow- or solid-stem auger. The borings will be sampled continuously using a 2.4-inch inside diameter (ID) split-spoon sampler. The sampler will be equipped with plastic, brass, or stainless steel sample liners. The borings will be advanced until the groundwater surface is encountered at approximately 6-10 ft below ground surface. Selected samples will be analyzed for one or more of the test procedures, as identified in Table 4.

Selected soil samples will be screened in the field using a flame ionization detector (FID; Foxboro or equivalent) and a photoionization detector (PID; TIP meter) held adjacent to freshly-broken sample surfaces. In addition, selected samples from each boring will be tested for headspace vapors and petroleum sheen using the following techniques:

FID: Approximately 4 oz of sample will be placed into a 32-oz plastic-sealed mason jar, shaken lightly, the left to equilibrate for 1/2 hour or longer. The FID probe will then be inserted through the plastic seal and measurements taken. The highest reading on the meter will be recorded.

PID: Approximately 4 oz of sample will be added to a 32-oz plastic-sealed mason jar. Sufficient deionized water will be added to cover the sample[1] (the addition of water aids in the volatization of compounds from soil to air). The jar will then be shaken for approximately 30 seconds and left to equilibrate for 1/2 hour or longer, after which the PID probe will be inserted through the plastic seal and measurements taken. The highest reading on the meter will be recorded along with observations of any sheen noted on the water surface in the jar.

The proposed testing program outlined in Table 4 may be modified based on the results of the field screening. Table 2 contains specific analytical procedures for each sample media.

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(1) Headspace technique recommended by Photo-Vac, Inc., manufacturer of the TIP meter.

TABLE 4

SOIL BORING SAMPLING/TESTING PROGRAM

Location	Approximate Number of Borings	Approximate Number of Samples to Be Collected and Analyzed: Driven Samples[a]	Total Petroleum Hydrocarbons[b]	Volatile Organics[c]	Semi-Volatile Organics[d]	Total Metals[d]	PCBs[e]
Interior of Current Impoundment	3	18	9	3	3	3	6
Interior of Former Impoundment	3	18	9	3	3	3	6
Outside of Former Impoundment	4	24	12	4	4	4	8
Former Catchment Basins	3	18	12	6	3	3	6
Subtotals	13	78	42	16	13	13	26
Quality Assurance			2	1	0	0	2
TOTALS	13	78	44	17	13	13	28

(a) Sampled continuously on 1.5-ft intervals from ground surface to groundwater surface.

(b) Collect two samples minimum per boring [one at groundwater surface, one from unsaturated zone (based on field screening results)]. Collect additional samples if necessary to characterize different soil/fill types.

(c) Collect one sample minimum per boring at water table or in unsaturated zone based on field screening results or soil/fill types.

(d) Collect one sample per boring.

(e) Collect sufficient number of samples to characterize different soil/fill material encountered during investigation (two per boring anticipated).

Samples for volatile organic analysis (VOA) will be taken by removing one 3- or 6-inch long sample liner, sealing each end of the tube with Teflon film, and then sealing the tube with end caps. If recovery is limited, the VOA sample will be collected by filling a sample bottle completely using a stainless-steel spoon.

Samples for semivolatile organic, PCB, and TPH analyses will be collected in one 3- or 6-inch long sample liner (as described above), or by placing representative portions of the sample into precleaned laboratory-supplied sample jars using a stainless-steel spoon.

Subsamples for metals analyses will be collected from the remaining sample after it has been thoroughly homogenized. The homogenized sample will be placed in an appropriate precleaned container for transport to the laboratory. All soil samples will be stored at approximately 4°C until delivered to the laboratory.

3.3.4 Sample Location Survey

All soil sample locations will be identified and flagged by the field crew. Sample locations will be surveyed for horizontal control by establishing a baseline with permanent steel or concrete markers set at each end. Horizontal control for each sample location will be determined by taping the radial distance to each location from each permanent marker. The intersection of the radii determines sample locations.

Vertical control will be provided at the monitoring wells only. Vertical control survey work will be performed by a professional, licensed surveyor, and will be referenced to a Boeing benchmark.

3.4 POST-INVESTIGATION TASKS

Following the investigation and review of analytical data the area will be re-graded and hydroseeded. If analytical results show that the berms/dike and cell bottoms consist of soil which is acceptable for re-use onsite, the berms/dike will be graded flat, the area reshaped for positive drainage, then hydroseeded.

In the event analytical results indicate that treatment or disposal of these materials is required, a determination will first be made if onsite treatment is viable. Clean onsite soil, which has been treated, will be managed as noted above.

If onsite treatment is not viable, the soil will be hauled offsite to an approved treatment/ disposal site by a licensed hauler. Depending on the depth that soil removal extends, the area

would then either be: 1) reshaped and hydroseeded, or 2) backfilled with clean soil, reshaped, and then hydroseeded.

4.0 REPORTING

Following receipt of all analytical data, a report will be prepared containing a description of the investigation, sampling results, and relevant findings. Previous results will be integrated where appropriate.

5.0 REFERENCES

CH_2M Hill Northwest. 1987. Soil and Groundwater Investigation, North Boeing Field Fire Drill Pit. December.

Laucks Testing Laboratories, Inc. 1984. Sediment Sampling and Testing Reports. May.

Shannon & Wilson. 1983. Subsurface Investigation of Petroleum Product Occurrence, North Boeing Field, Fire Practice Pit. July 12.

APPENDIX A

Equipment Decontamination and Residuals Management

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EQUIPMENT DECONTAMINATION AND RESIDUALS MANAGEMENT

A decontamination station will be established onsite. The station will be designed such that all water collected during the decontamination process can be collected and disposed of at an appropriate location. The drill rig control panel area and all downhole drilling equipment will be cleaned using a high-pressure hot water wash before and after each boring as required by WAC 173-160-530. Appropriate decontamination procedures for soil and groundwater sampling equipment will be employed to minimize the possibility of cross contamination. Sampling equipment that comes into contact with potentially contaminated soil or water will be decontaminated prior to and after each use. Decontamination of sampling equipment will consist of the following steps:

- Spray or scrub soiled equipment
- Wash with Alconox soap
- Rinse with tap water
- Rinse with steam stilled or laboratory supplied deionized water.

During the field investigation, any residual materials generated from either drilling, monitoring well development, groundwater sampling, or equipment washdown will be collected in appropriate containers. A summary of the disposition of these residuals is presented in Table A-1.

TABLE A-1

RESIDUALS MANAGEMENT

Activity	Disposition of Residuals
Drilling	Soil cuttings and water will be contained in drums[(a)]
Groundwater sampling	Purge and decontamination water will be contained in drums
Downhole equipment washdown	Water will be transferred from decontamination station to storage tanks or drums
Protective clothing/miscellaneous disposables	Place into dumpster or drums

(a) Management of drummed materials:

- Drums will be labeled with the following information:
  - Source of material
  - Matrix
  - Date
  - Name of firm/individual responsible for final disposition
- Drums will be stored in a secured location
- Disposal will be determined following evaluation of laboratory data for each location.

APPENDIX B

Health and Safety Plan

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HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

This plan presents health and safety requirements for an investigation of the North Boeing Field Fire Training Center (NBFFTC) in Seattle, Washington. The plan presents a description of existing site conditions and organization, safety rules and procedures, criteria for hazard and risk analysis, description of levels of personal protection and required equipment, air monitoring procedures, emergency response information, and requirements pertaining to training and medical monitoring of onsite personnel.

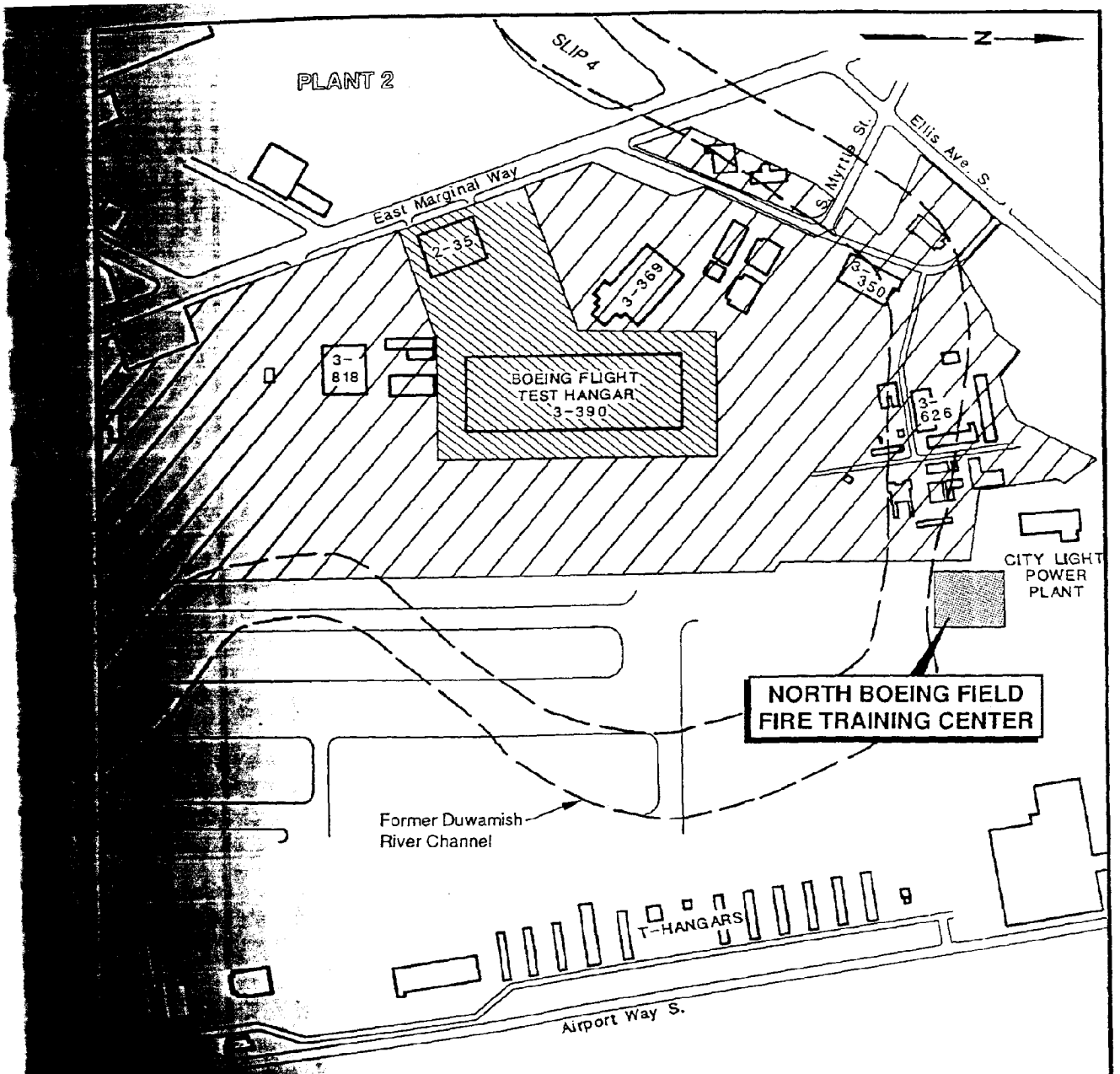
Each Landau Associates' subcontractor is required to prepare and submit to Landau Associates and Boeing a health and safety plan covering the subcontractors' respective work on the site. The requirements outlined in this plan are considered the minimum health and safety requirements due to potential site contamination and are intended to be incorporated by each subcontractor into their respective health and safety plan. Each subcontractor may choose to apply more stringent health and safety requirements. This plan does not address physical worker safety issues that may be associated with excavation, trenching and shoring (WAC 296-155, Part N), or work in confined spaces (WAC 296-62, Part M). Relevant federal, state, or local standards should be consulted for such information prior to digging test pits at the site.

1.1 SITE BACKGROUND

Site investigation will be carried out at the location where fire training activity is known to have occurred, as shown on Figure B-1. Soil and groundwater samples were taken during previous investigations of the site. These data are summarized in Table B-1. The results of the earlier investigations indicate that contamination, where present, occurs primarily as constituents of fuel; however, site characterization is still incomplete.

1.2 PURPOSE, APPLICABILITY, AND ADHERENCE

Investigation of the site will include drilling of soil borings and collection of soil and groundwater samples. These activities will involve disturbance and removal of potentially contaminated soil and groundwater. The health and safety requirements herein are directed at protecting workers from exposure to organic gases and vapors and potentially contaminated soil and groundwater during these activities. These health and safety requirements apply to all site workers including subcontractors or others entering the site.



BCA-Owned Property (1987)

BCA-Leased Property (1987)

Training Center, Easement Area (1987)

International (1974).

Location Map
North Boeing Field Fire Training Center

Figure B-1

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			Permissible Exposure Limit Time Weighted Average		Threshold Limit Value Time Weighted Average					
			(ppm)	(mg/m³)	(ppm)	(mg/m³)	Immediately Dangerous to Life and Health Concentrations	Route of Exposure[a]	Symptoms of Acute Exposure	Instruments Used to Monitor Contaminant
		0.087 (NBF-MW-1)	31 (NBF-MW-2)	100	–	50	174	5,000 ppm	Inh, Ing, Con	Fatigue, weakness, steepness	PID
	Acetone	0.130 (NBF-MW-1)	12 (NBF-MW-3)	750	1,800	750	1,780	20,000 ppm	Inh, Ing, Con	Irritated eyes, nose, throat, headache	PID
	Arsenic	0.0056 (NBF-MW-1)	12 (NBF-MW-4)	–	10 µg/m³[b]	–	0.2[c]	100 mg/m³	Inh, Ing, Con, Abs	Dermatitis, GI disturbance	HAM
	Benzene	–	–	1.0[d]	–	10	32	3,000 ppm	Inh, Ing, Con, Abs	Irritated eyes, nose, respiratory system, headaches	PID, detector tubes
	Lead	150[e]	–	–	0.05	–	0.15[f]	700 mg/m³	Inh, Ing, Con	Weakness, abdominal pain	HAM
	PCBs	8.7[e]	–	–	0.5 (skin)[g]	–	0.5 (skin)[g]	5 mg/m³	Inh, Abs, Ing, Con	Irritated eyes, skin	–
	Chloroform	0.007 (NBF-MW-1)	–	2.0	9.78	10	49	1,000 ppm	Inh, Ing, Con	Dizziness, headache, nausea	PID
	Xylenes	0.087 (NBF-MW-1)	–	100	435	100	434	1,000 ppm	Inh, Abs, Ing, Con	Irritated eyes, nose, throat, dizziness	PID
	Di-n-Butylphthalate	1.0 (NBF-MW-1)	–	–	–	–	5	9,300 mg/m³	Inh, Ing, Con	Irritated respiratory tract and stomach	–
	Tetrachloroethylene	0.098 (NBF-MW-1)	–	25	170	50	339	500 ppm	Inh, Ing, Con	Irritated eyes, nose, throat, nausea	PID
	Toluene	0.011 (NBF-MW-1)	–	100	375	100	377	2,000 ppm	Inh, Abs, Ing, Con	Fatigue, weakness, confusion, headache	PID

(a) Inh = inhalation; Abs = skin absorption; Ing = ingestion; Con = skin and/or eye contact.

(b) Action level is 5 µg/m³.

(c) As soluble arsenic compounds.

(d) Action level is 0.5 ppm.

(e) Results reported in Laucks Testing Laboratory Report (1984). Highest lead levels were detected in Samples 1, 2, 8, and 11; highest PCB levels were detected in Sample 11.

(f) As inorganic dusts and fumes.

(g) As chlorodiphenyls with 54 percent chlorine.

03/27/92 BOEING\NBF\FEB-TAB B-1

All individuals working onsite must read the Health and Safety Plan prior to participation in field work. If any information presented in this plan is unclear, the reader must contact the Landau Associates Site Safety Officer for clarification prior to participating in any field activity. Once the information has been read and understood, the individual must sign the Health and Safety Acknowledgement Form (Figure B-2); this executed form will be kept in the job file. After each individual has read the Health and Safety Plan, but before participating in field activities, a training session will be conducted to familiarize personnel with health and safety requirements at the site (see Section 8.0 of this Plan).

This Health and Safety Plan has been designed to be flexible, in order to allow unanticipated site-specific problems to be addressed, while providing adequate and suitable worker protection. These requirements may be modified at any time by the Boeing Project Manager or Landau Associates Site Safety Officer. Any modification will be presented to the onsite team during a safety briefing and documented using the Health and Safety Plan Modification Form (Figure B-3).

1.3 PROJECT ORGANIZATION AND RESPONSIBILITIES

1.3.1 Boeing Project Manager

The Boeing Project Manager for this phase of the project is Mr. Brian Anderson. He has responsibility over all project planning and execution. He will be responsible for making project-level decisions regarding safety rules and operations in consultation with the Landau Associates Site Safety Officer. The Boeing Project Manager may close down the project if health and safety issues warrant. Specific responsibilities of the Boeing Project Manager include:

- Monitoring the subcontractors for compliance with their site health and safety plans
- Conducting orientation training with the assistance of the Landau Associates Site Safety Officer for all personnel prior to beginning their activities
- Determining minimum personal protection levels and necessary clothing and equipment
- Seeing that all monitoring equipment is calibrated on a daily basis, is operating correctly, and that the results are recorded properly.

FIGURE B-2

HEALTH AND SAFETY ACKNOWLEDGEMENT FORM

I have read and understand the Health and Safety Plan for the North Boeing Field Fire Training Center Investigation at the King County Airport and have discussed any questions which I have regarding site contaminants with my supervisor and the designated Site Safety Officer. I agree to follow the requirements of the Plan.

Firm _____

Employee _____ Date _____

Supervisor _____ Date _____

FIGURE B-3

HEALTH AND SAFETY PLAN MODIFICATION FORM

NORTH BOEING FIELD FIRE TRAINING CENTER INVESTIGATION PROJECT

KING COUNTY AIRPORT

DATE ___/___/___

Modification: _____

_____

_____

_____

Reasons for Modification: _____

_____

_____

_____

Site Personnel Briefed:

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Approvals

Designated Site Safety Officer: _____

KCIA/NBF Project Manager: _____

_____

Boeing Field Coordinator

A Boeing Field Coordinator will be assigned to this project who will be responsible for day-to-day activities at the site. He/she will notify the Site Safety Officer of conditions which come to the attention of Boeing during the course of the project, which would require modifications to the subcontractors' health and safety plans. The Boeing Field Coordinator's responsibilities include, but are not limited to, the following:

- Review and approval of the Health and Safety Plan with concurrence from the Boeing Project Manager
- Suggesting modifications to the Health and Safety Plan, as appropriate, with concurrence from the Site Safety Officer and Boeing Project Manager
- Determining, with concurrence from the Site Safety Officer, if the level of projection should be upgraded
- Perform field monitoring, as appropriate
- Maintain project files for Boeing including:
  - Health and Safety Acknowledgement Form (Figure B-2)
  - Health and Safety Plan Modification Form (Figure B-3)
  - Training Form (Figure B-4)
  - Employee Exposure/Injury Incident Report Form (Figure B-8, see Page B-24)
  - Records of all daily monitoring results.

Site Safety Representative

Landau Associates shall have a designated Site Safety Officer onsite during all intrusive activities. Each subcontractor shall also assign a site safety representative for this project. He/she will be responsible for the implementation of their health and safety plan. The Site Safety Officer and representative shall:

- Establish that personnel are aware of health and safety requirements and the potential hazards associated with the work, are instructed in safe work practices, and understand the planned procedures for dealing with emergencies
- Provide that all required forms are completed and that originals of those forms are provided to the Boeing Project Manager
- Correct any work practices or conditions that may result in injury to personnel or exposure to hazardous substances

FIGURE B-4

TRAINING FORM

Employee Name: _____

Address: _____

Phone: _____

Company: _____

Training:

List all successfully completed Health and Safety Training

Date	Location	Trainer	Hours	Title/Subject Matter

I certify that I have successfully completed the training programs listed above.

_____
Signature

_____
Date

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- Require that appropriate personal protective equipment is properly used by all onsite personnel
- Report any deviations for the anticipated conditions described in this document to the Boeing Project Manager or designated representative.

2.0 SITE DESCRIPTION, ORGANIZATION, AND OPERATION

2.1 SITE DEFINITION

The site is defined by the approximate limits of the NBFFTC as well as any incidental areas where site-related activities occur. Figure B-1 shows the areas of primary concern in relation to the North Boeing Field facility.

2.2 SITE ORGANIZATION AND OPERATION

The site layout will consist of exclusion zones and contamination reduction zones. Site zones boundaries may require modification during onsite activities. The exclusion zones encompass the area where intrusive work is occurring. The exclusion zones will be maintained as such only during periods when intrusive activities such as drilling are being conducted.

2.2.1 Exclusion Zones

Only those persons having read this or an equivalent subcontractor Health and Safety Plan and who have signed the Health and Safety Acknowledgement Form (Figure B-2) will be allowed in the exclusion zones. The level of protection required in the exclusion zones will depend on the activities being conducted, and may be adjusted as conditions change. All operations will be restricted to the support zones. The required levels of protection are discussed in Sections 4.0 and 5.0 of this Health and Safety Plan.

2.2.2 Contamination Reduction Zones

The contamination reduction zones will be established for both personnel and equipment decontamination. These areas will be used to limit the transfer of potentially contaminated soil. The recommended layout for the transition from the exclusion zones to the contamination reduction zones will be determined by the designated Site Safety Officer. An example of the type of layout that may be used is shown on Figure B-5.

Site personnel will suit-up in personal protective equipment consistent with the Health and Safety Plan while in the contamination reduction zones, or other designated area before

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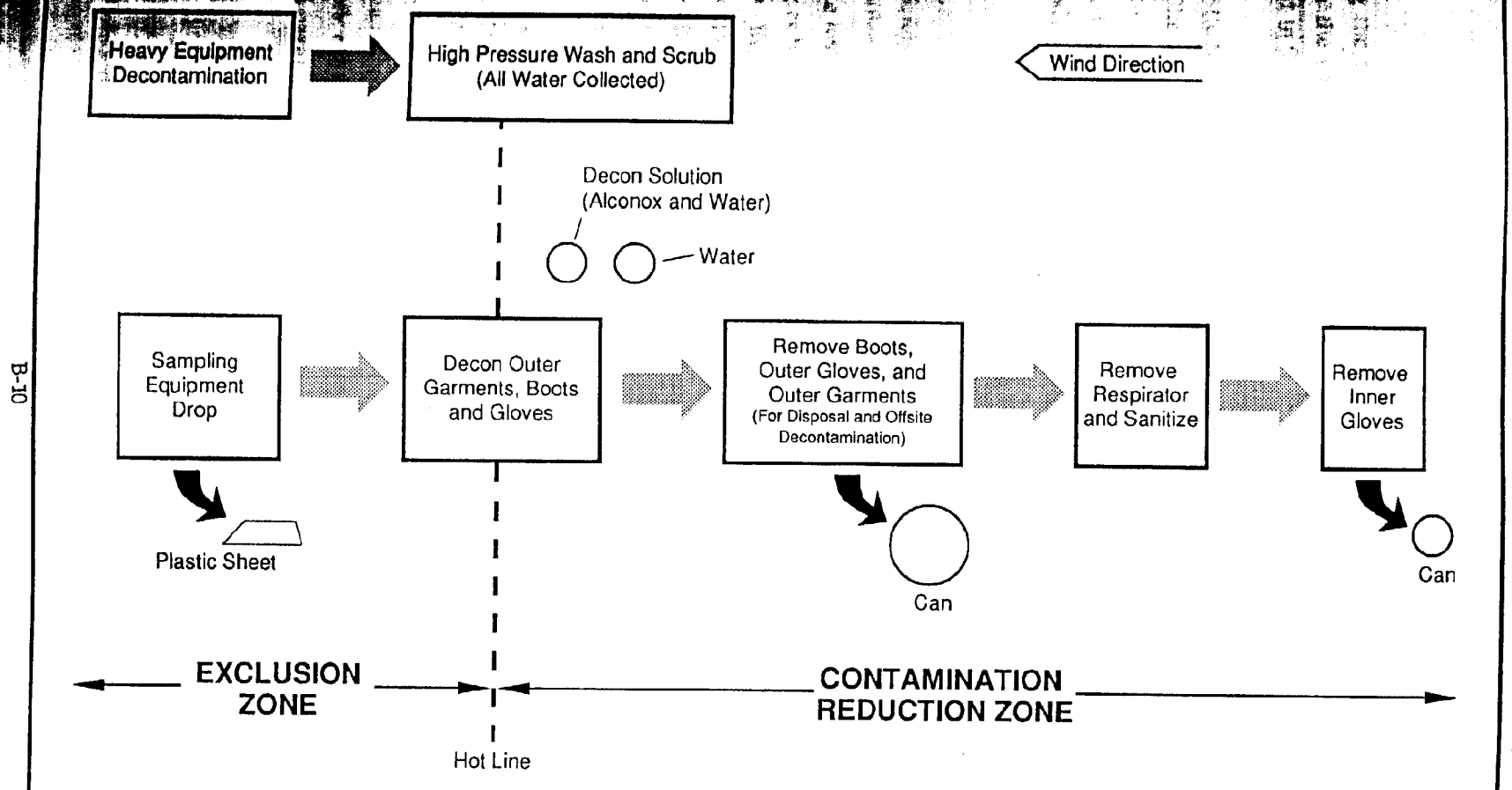


Schematic of Transition from Exclusion Zone to Contamination Reduction Zone

Figure B-5

entering the exclusion zones. All personnel and equipment will leave the exclusion zones through the contamination reduction zones and adhere to decontamination procedures as specified in Section 3.4.1 of this Plan.

2.2.3 Site Security

Site security will be the responsibility of the Boeing Project Manager (or designee). Access to the contamination reduction zones for all personnel involved in this work may be controlled through the use of flagging, reflective tape, or barricades. The exclusion zones will also be identified using warning tape, flagging, or barricades.

3.0 SAFETY PROCEDURES

Safety must be the concern of every individual involved in project activities. Whether in the office or onsite, properly followed procedures are essential for personal safety and to minimize lost time due to injuries or accidents involving equipment. Potential hazards while working at the site include, but are not limited to:

- Exposure to toxic and/or hazardous chemicals
- Physical hazards from heavy equipment
- Fire or explosion caused by flammable or combustible materials
- Heat stress caused by personal protective equipment and/or weather
- Aircraft traffic associated with the King County Airport.

3.1 CHEMICAL HAZARDS

Organic compounds and metals are potentially present within soil and groundwater at the site. The presence of such compounds, some of which are known or suspected human carcinogens, may require the special considerations outlined within these health and safety requirements and each subcontractor's health and safety plan. Section 4.0 of this Plan identifies the specific compounds of concern and action levels for which personal protection against such chemical hazards must be taken.

3.2 PHYSICAL HAZARDS

Field work near heavy equipment operations poses physical hazards. Workers will need to be aware of all heavy equipment activity and be ready to avoid moving vehicles. Mobile construction equipment shall be equipped with backup alarms and all workers will be

madeaware of their use. Only operators of heavy equipment will be allowed to ride on the equipment. Relevant federal, state, and local laws/regulations governing construction must be followed.

3.3 GENERAL SAFETY REQUIREMENTS

Project personnel have the responsibility for:

1. Taking all reasonable precautions to prevent injury to themselves and others
2. Performing only those tasks that they believe they can do safely, and immediately reporting the presence of unsafe conditions
3. Implementing the health and safety requirements, and reporting any deviation from the procedures to the Boeing Field Coordinator or designated Site Safety Officer
4. Notifying the Boeing Field Coordinator or designated Site Safety Officer of any special medical problems and ensuring that all appropriate onsite personnel are aware of any such problems.

The following general safety rules apply:

1. Workers will enter the exclusion zones from the upward side of the site unless it becomes impractical.
2. Working while under the influence of intoxicants, narcotics, or controlled substances is prohibited. The use of any prescription drug shall be reported to the Boeing Field Coordinator.
3. Long hair must be contained inside a hard hat. Individuals required to wear respirators shall not have beards.
4. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited inside the designated "exclusion zones" or "contamination reduction zones." Washing hands, forearms, and face are required before taking meals.
5. Unapproved work clothes will not be allowed within the exclusion zones or the contamination reduction zones.
6. Exchange of personal protective equipment will not be allowed.
7. Climbing or standing on machinery or equipment is prohibited unless authorized by the Boeing Field Coordinator.

3.4 SITE EXIT DECONTAMINATION

All personnel and equipment must be properly decontaminated before leaving the contamination reduction zones. All personnel and equipment that have entered the exclusion zones will leave only through the contamination reduction zones.

3.4.1 Routine Decontamination Procedures

All personnel and equipment will undergo appropriate decontamination procedures prior to leaving the site. A decontamination area will be set up in the contamination reduction zones shown on Figure B-5. Before commencing work on the site, all personnel will be trained by the designated Site Safety Officer in site-specific decontamination procedures. Personal decontamination will be as follows:

Step 1: Wash and rinse non-disposable protective clothing.

Step 2: Remove disposable clothing. Place in marked receptacle.

Step 3: Remove, wash, rinse, and sanitize respirator (if used).

Step 4: Exit the contamination reduction zones.

Step 5: Wash hands and face.

3.4.2 Emergency Decontamination

In case of an emergency, gross decontamination procedures will be speedily implemented if possible. If a life-threatening injury occurs and the injured person cannot undergo decontamination procedures without incurring additional injuries or risk, he/she will be transported wrapped in plastic sheeting. The medical facility will be: 1) informed that the injured person has not been decontaminated and 2) given information regarding the most probable contaminants.

3.4.3 Personal Protective Equipment Decontamination

Certain parts of contaminated respirators such as the harness assembly or cloth components are difficult to decontaminate. If grossly contaminated, they will be discarded. Rubber components will be soaked in soap and water and scrubbed with a brush. Respirators will be sanitized by rinsing in a detergent solution followed by a clear rinse, then hung to dry. Each person will be responsible for decontaminating his/her own respirator and will be trained in respirator maintenance as part of the health and safety training program.

3.4.4 Heavy Equipment Decontamination

All heavy equipment must be thoroughly decontaminated prior to leaving the site. Particular care will be taken in decontaminating those parts of heavy equipment that have come into direct contact with soil, such as tracks, tires, shovels, grapples, and scoops.

For wet decontamination procedures, high-pressure water will be used (hot water if necessary). Physical scrubbing with disposable brushes will be used when necessary to loosen materials.

3.5 DISPOSAL OF CONTAMINATED FLUIDS AND MATERIALS

All equipment and materials used for decontamination or personal protection will be cleaned or collected for appropriate disposal. All non-disposable clothing and equipment will be decontaminated onsite. Disposables will be containerized. Contaminated liquids will be collected in storage tanks or drums and disposed of as required based on sampling and analysis.

3.6 HOUSEKEEPING

Work areas will be kept clean and orderly at all times. Ordinary refuse will be placed in suitable rubbish bins or trash containers. Extraneous materials will be minimized within the exclusion zones to reduce the decontamination load and possibilities for cross contamination.

3.7 VISITORS

All visitors must be cleared by the Boeing Project Manager, Boeing Field Coordinator, or designee. Visitors will only be allowed to observe operations, and must obey all instructions of the Boeing Field Coordinator.

3.8 SPECIAL HAZARDS/SAFETY

Large aircraft takeoff and landing at North Boeing Field may present a noise hazard to [illegible] personnel. All site personnel will be equipped with hearing protection which is compatible with other personal safety equipment which may be required. This hearing protection will be [illegible] when it is evident that aircraft noise is imminent and any work which may present [illegible] safety hazards because of use of hearing protection will be discontinued until hearing protection can be removed.

4.0 HAZARD/RISK ANALYSIS

4.1 BASIS FOR ANALYSIS

Previous investigations have tentatively identified certain constituents of concern at the site. However, present information is not complete enough to accurately determine risk levels. Anticipated exposure limits are summarized in Table B-1. Documents identified Section 10.0 were used in assessing site hazards/risks.

4.2 HAZARD ANALYSIS

The degree of overall hazard depends on the activity being performed, the compounds encountered, and the quantity of dust and/or vapors generated during construction activities. Specific hazards are discussed below.

4.2.1 Fire/Explosion

Although some of the chemical compounds which were probably handled at the site can be explosive or flammable, they are typically found in relatively low concentrations, making the risk of fire or explosive conditions unlikely.

4.3 ACTION LEVELS FOR REQUIRED PROTECTION

Table B-1 lists exposure limits that will trigger upgrading personal protective equipment requirements. The exposure limits listed assume sustained readings of one minute or more in the breathing zones. The personal protective equipment requirement applies to the area within a 30-foot radius of where measured. Justification for the exposure limits is presented in Section 4.4.

It is anticipated that most of the project site activities will be performed at Level D (modified), supplemented with air purifying respirators if the action levels identified for Level C in Section 4.4.1 are reached. Nuisance solvent odors which do not present a potential health hazard may be evident during aircraft takeoff and landing at North Boeing Field. The air purifying respirators may be used at the discretion of site personnel for comfort in these circumstances.

4.4 JUSTIFICATION FOR EXPOSURE LIMITS

4.4.1 Level D to Level C Action Levels

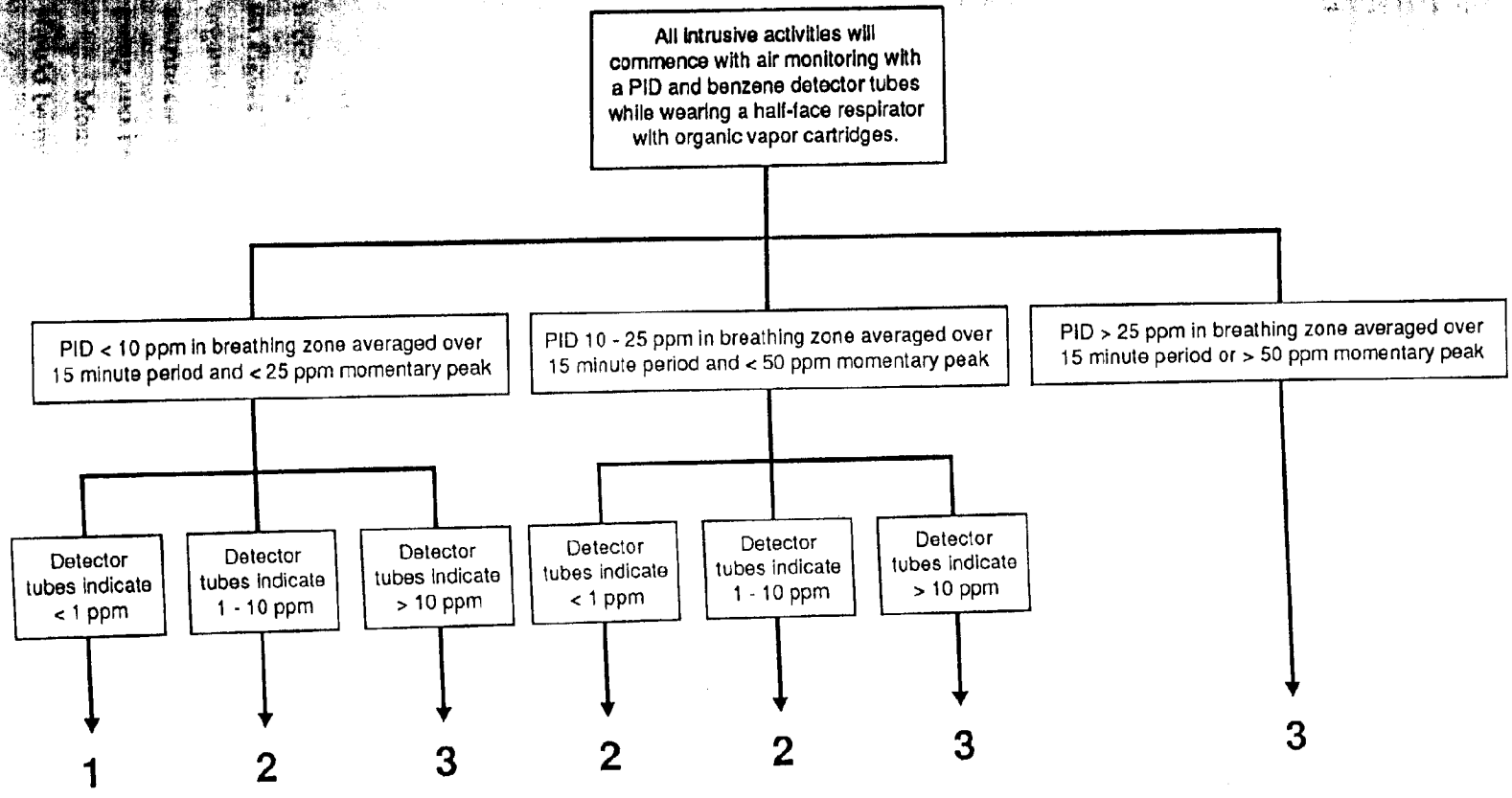
Benzene is the constituent which may be present onsite which has the lowest Permissible Exposure Limit (PEL) and State-established action level. The PEL is 1.0 ppm, and the action level set by the state, which is the level at which monitoring for the constituent must be implemented, is 0.5 ppm. Benzene is readily detected using a photoionization detector (PID) (ionization potential = 10 for benzene with a 10.2 ev lamp). However, the 0.5 ppm action level is based on a concentration which the TIP meter cannot accurately detect. Therefore, monitoring will also be conducted at the initiation of intrusive activity with detector tubes and hand pump for the purpose of monitoring specifically for benzene at concentrations less than 1.0 ppm. If no benzene is present, higher action levels for donning respiratory protection have been established, as indicated by Figure B-6.

4.4.2 Level C Action Levels

A full-face respirator, equipped with organic vapor and high efficiency particulate cartridges, provides a protection factor of 100, and a half-face respirator provides a protection factor of 10. Thus, a full-face respirator may be worn in concentrations up to 100 times the TLV values noted in Table B-1, and a half-face respirator in concentrations up to 10 times these values.

Based on the previous investigations, it is not expected that Level C action levels will be exceeded. However, if they are, half-face respirators will be worn (assuming the concentration of the airborne constituents is less than 10 times the exposure limits). Half-face respirators are preferred to full-face because of their less restrictive nature and decreased visual impairment. Visual impairment is of concern because of potential worker exposure to heavy equipment injury. However, if levels do exceed 10 times the exposure limits, full-face respirators will be required.

Field conditions are not expected to exceed the 100 protection factor level, such that Level B protection would be required. If conditions are encountered that warrant Level B protection, safety procedures will be revised prior to commencing or continuing activities.



1 = LEVEL D and continued monitoring

2 = LEVEL C (half-face respirator with organic vapor cartridges) and continued monitoring

3 = LEVEL B (refer to text of Health and Safety Plan)

Action Levels for Respiratory Protection During Intrusive Activity at the Boeing Plant 2 Southeast Facility

Figure B-6

5.0 PERSONAL SAFETY EQUIPMENT

5.1 REQUIRED EQUIPMENT

Equipment required for the various levels of protection expected onsite are listed below:

Level D (Modified):

- Tyvek or coveralls (Saranex or equivalent water resistent coveralls or rain gear when direct contact with wet soil is expected)
- Heavy duty nitrile or neoprene outer gloves
- Vinyl or latex inner gloves
- Hard hat
- Safety glasses
- Steel-toe and steel-shank neoprene or rubber boots
- Hearing protection (ear muffs or plugs) that is compatible with use of other required personal safety equipment.

Workers in the exclusion zones will have their Tyvek (or equivalent) taped to the gloves at the wrist and to the boots at the ankles when in contact with wet soil.

Level C (Modified):

- Level D (modified) equipment
- Half- or full-face air-purifying respirator equipped with high efficiency air purifying OVAG/particulate cartridges. Respirators must be MSHA/NIOSH approved. Cartridges will be changed daily (if used) or more frequently if directed by the designated Site Safety Officer.

6.0 AIR MONITORING

Air monitoring will be performed by the designated Site Safety Officer to determine necessary levels of respiratory protection (based on action level given in Sections 4.4.1, 4.4.2, and on Figure B-6). Background readings will be taken upwind of site activities. Monitoring for organic vapors shall be accomplished using a photoionization detector, which is a portable instrument that measures the concentration of ionizable compounds in air, and with a hand pump and benzene detector tubes, as indicated on Figure B-6.

Monitoring for aerosols is not expected to be necessary because particulate generation should be minimal. However, if particulates (dust) are generated in the exclusion zones, then

a hand-held aerosol monitor and radiation detector shall be used to monitor particulate levels and an appropriate PEL set by the designated Site Safety Officer.

7.0 EMERGENCY RESPONSE

Emergency Facilities and Numbers

Hospital: Harborview Medical Center
325 9th Avenue
Seattle, WA

Information: 223-3036 Emergency: 223-3074

Directions:

Take Ellis Avenue north to Warsaw Street, turn left; take Warsaw to Carleton and turn right; take Carleton east to the I-5 entrance and get on I-5 northbound; take I-5 to the Madison Street exit, take right onto Madison, go four blocks to Boren and turn right, go six blocks to Terrace Street, and follow signs to Harborview emergency room entrance.

Other Emergency Telephone:

Site Fire Department -
Site Security -

Emergency Transportation Systems (fire, police, ambulance): 911

Emergency Route

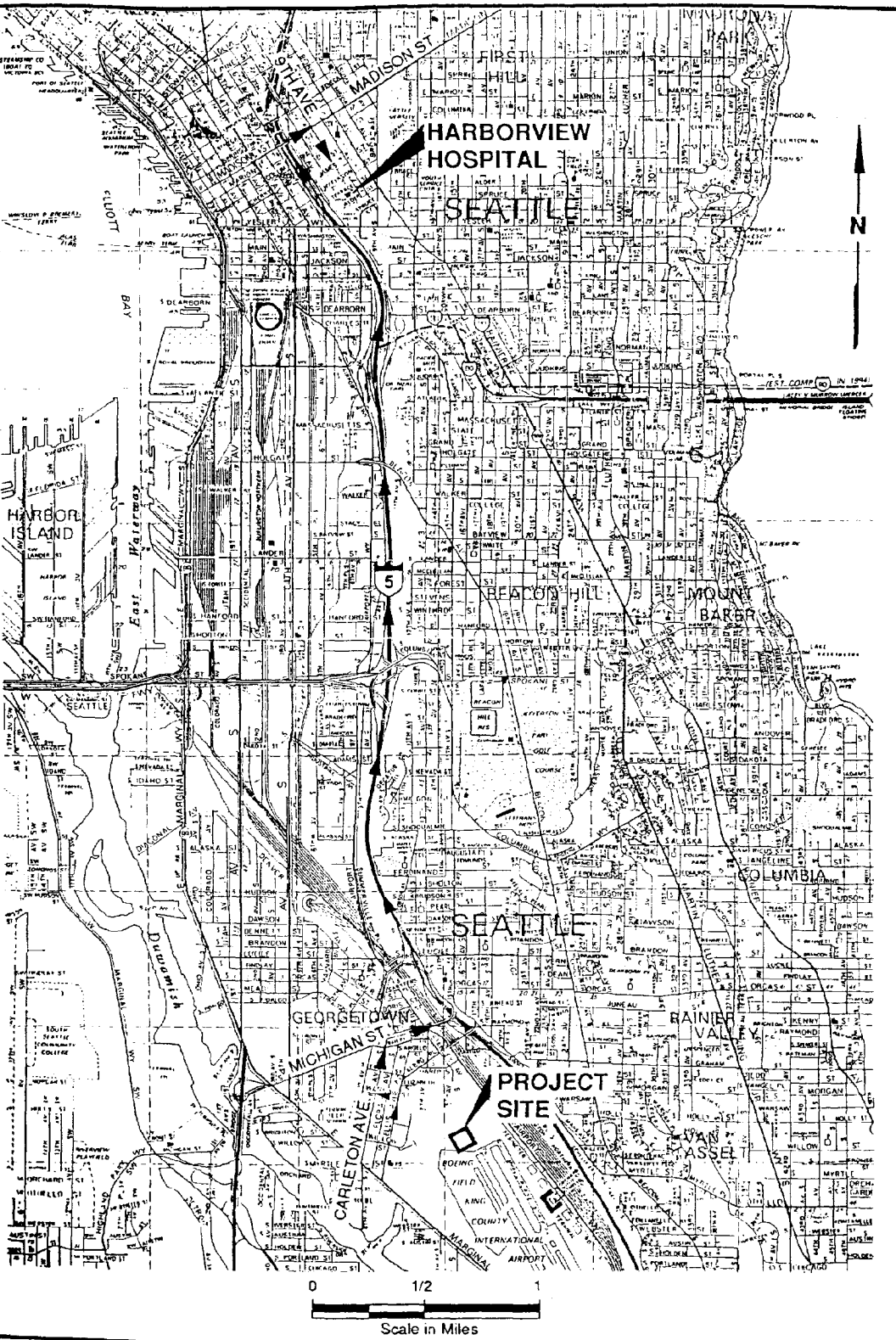
See Figure B-7

Emergency Contacts

Emergency/Fire - 911
Hospital - 223-3074
Brian Anderson (Boeing Project Manager) - Office 447-2184
Site Fire Department - 655-2222
Bill Evans (Landau Associates Project Manager) - Office 778-0907

In the event of an emergency, do the following:

1. **Call** 911 for help as soon as possible. Give the following information:
   - **WHERE** the emergency is - use cross streets or landmarks
   - **PHONE NUMBER** you are calling from
   - **WHAT HAPPENED** - type of injury
   - **HOW MANY** persons need help
   - **WHAT** is being done for the victim(s)
   - **YOU HANG UP LAST** - let the person you called hang up first



Emergency Route to Hospital

Figure B-7

2. Transport to the hospital will be performed by local emergency response professionals in all cases except minor injuries requiring non-emergency treatment. If the injury or exposure is not life threatening, decontaminate the individual first. If decontamination is not feasible, wrap the individual in a blanket or sheet of plastic prior to transport.

3. Make appropriate site contact(s), call Boeing Project Manager.

7.1 ONSITE EMERGENCY EQUIPMENT

An Industrial First Aid Kit, a 20-pound type ABC portable fire extinguisher, and an eyewash kit will be maintained at the site.

7.2 OFFSITE EMERGENCY SERVICES

A copy of the EMERGENCY FACILITIES AND NUMBERS will be posted next to the telephone identified for emergency use.

7.3 NON-LIFE THREATENING EMERGENCIES

7.3.1 Injuries

In emergency situations which are not life-threatening (e.g., a broken leg), some decontamination procedures may be modified according to the specific circumstances. Outer protective clothing should be removed if doing so would not cause delays or aggravate the injury. Respirators should only be removed: 1) if the victim has stopped breathing, or 2) after the victim has been removed from a breathing hazard area. Normal decontamination procedures should be followed when possible.

Bodily injuries which occur as a result of an accident during operations at the site will be handled in the following manner:

- The victim will be administered to by an individual who holds current first-aid and/or CPR certifications utilizing the emergency equipment onsite.
- The local first-aid squad/rescue unit, a local hospital, and the Boeing Project Manager will be notified depending on the nature of the emergency.

7.3.2 Heat-related Illnesses

Heat-related illnesses can occur at any time when protective clothing is worn. Workers [illegible] vapor-permeable or impermeable encapsulating clothing should be monitored when the temperature in the work area is above 70°F (21°C). Heat stress monitoring includes regular

checks of heart rate. The designated Site Safety Officer shall be trained in monitoring, treating, and recognizing the signs of heat stress. Unless the victim is obviously contaminated, decontamination should be minimized and treatment begun immediately.

7.3.3 Flu-Like Symptoms

No personnel with flu-like symptoms will be allowed to work in the exclusion zones. Any site personnel developing flu-like symptoms while at work will be sufficient cause for ceasing operations until the work area is evaluated and a "return to operations" is cleared by the designated Site Safety Officer.

7.4 FIRE

A fire extinguisher (ABC) will be kept onsite during construction activities. This equipment will be used only to respond to minor fires. In the event of major fires, explosions, or fire/explosion hazard conditions, all personnel will immediately sound the appropriate alarm to others on the site and evacuate to the contamination reduction zones. The designated Site Safety Officer will evaluate the need for further evacuation and/or emergency services.

7.5 SITE EVALUATION AND EVACUATION

The designated Site Safety Officer will be responsible for determining if circumstances exist which require re-evaluation and/or evacuation.

7.5.1 Stages of Evacuation

Two levels of evacuation have been considered:

- Withdrawal from the immediate work area onsite
- Evacuation of the surrounding area.

7.5.1.1 Withdraw From Work Area

Withdrawal to a safe upwind location will be required under the following circumstances:

- Detection of volatile organics and/or toxic gases at concentrations above action levels for the level of protection being worn (see Sections 4.3 and 4.4)
- Occurrence of a minor accident - field operations will resume after first-aid and decontamination procedures have been administered
- Malfunction or failure of protective equipment, clothing, or respirator.

7.5.1.2 Evacuation of Surrounding Area

There are no foreseeable conditions based on current knowledge at the site that would require evacuation of the surrounding area. The Boeing Field Coordinator will be responsible for determining if circumstances exist for area-wide evacuation after consultation with the designated Site Safety Officer, and should always assume worst case conditions until proven otherwise. Fire and police departments must be contacted. A list of emergency response individuals familiar with site work, including addresses and telephone numbers, will be located at the site, and will be carried by both the designated Site Safety Officer and the Boeing Field Coordinator. If evacuation is necessary, it will be implemented with the assistance of these emergency response personnel.

7.6 ACCIDENT/INCIDENT REPORTING PROCEDURES

Procedures for reporting accidents/incidents are listed below. They will be performed in the order indicated.

1. Call appropriate emergency services numbers (ambulance, fire, etc.). Provide information listed below.
2. Call the Boeing Project Manager and provide information listed below.
3. A Site Safety Officer will complete a written accident/incident report (Figure B-8) within 24 hours, sending copies to the Boeing Project Manager.

Give the following information when reporting an emergency:

1. Name and location of person reporting
2. Location of accident/incident
3. Name and affiliation of injured party
4. Description of injuries
5. Status of medical aid effort
6. Details of any chemicals involved
7. Summary of the accident, including the suspected cause and the time it occurred.
8. Temporary control measures taken to minimize further risk.

FIGURE B-8
EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT FORM
(Use additional page if necessary)

Date: _____ Time: _____

Name: _____ Employer: _____

Site Name and Location: _____

Site Weather (clear, rain, snow, etc.): _____

_____

Nature of Illness/Injury: _____

_____

Symptoms: _____

Action Taken: Rest _____ First Aid _____ Medical _____

Transported by: _____

Witnessed by: _____

Hospital's Name: _____

Treatment: _____

Comments: _____

_____

What was the person doing at the time of the accident/incident? _____

_____

Personal Protective Equipment Worn: _____

_____

Cause of Accident/Incident: _____

_____

_____

Immediate action was taken to prevent recurrence? _____

_____

_____

comments:

Signature: _____ Date

Supervisor's Signature: _____ Date

Site Safety Officer's Signature

_____ Date

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This information is not to be released under any circumstances to parties other than those listed in this section and bona fide emergency response team members.

8.0 TRAINING

Orientation training will be held prior to beginning work onsite. If appropriate, based on site observation and air monitoring results, the Boeing Project Manager or the Site Health and Safety Officer may require site personnel to have additional safety training. The initial training will be supplemented, as necessary, in subsequent safety meetings. Orientation training will include:

- Health effects and hazards of the chemicals identified or suspected to be at the site
- Personal protection requirements
- Personal hygiene (beards, etc.)
- Use, care, maintenance, and fitting of personal protective equipment including fit-testing of air purifying respirators. Training in respiratory equipment use will conform to ANSI Z818.2 (1980) and 29 CFR 1910.134, which establishes the necessity, effectiveness, and limitations of respiratory equipment. Workers with limiting physical disabilities such as respiratory ailments shall not be assigned to tasks requiring the use of respirators
- Decontamination procedures
- Accepted practices for entry, exit, and activities with specific area of the site, including prohibition of food consumption and smoking within the exclusion zones and the contamination reduction zones
- Emergency response procedures as specified in Section 7.0 of this Health and Safety Plan.
- Review and assessment of equipment

Written documentation of onsite training will be maintained by the Boeing Field Coordinator and the Site Safety Officer.

9.0 MEDICAL MONITORING

A baseline medical evaluation will be required for all employees, subcontractors, and contractors working onsite in the exclusion zones or contamination reduction zones. The surveillance program will be in compliance with 29 CFR 1910.120. All personnel

working in these areas must be determined to be physically qualified to wear respiratory protection by a physician.

10.0 REFERENCES

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